SHORT COMMUNICATIONS

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DIURNAL VOCAL ACTIVITY OF YOUNG EAGLE OWLS AND ITS IMPLICATIONS IN DETECTING OCCUPIED NESTS

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Vocal surveys are used extensively to locate nests and estimate numbers of birds (Ralph and Scott 1981, Fuller and Mosher 1987, Ralph et al. 1995, Stewart et al. 1996). They are particularly useful for nocturnal birds that cannot be easily located during the day (Reid et al. 1999). Due to the crepuscular and nocturnal habits of owls, numerous census techniques have been developed (Fuller and Mosher 1981, Smith 1987). They include visual searches, passive auditory surveys (Reid et al. 1999), location of roosts and nests, and use of tape-recorded calls to elicit responses (acoustic-lure survey, Reid et al. 1999).

When a species is being censused, it is essential to have a good knowledge of its behavior and breeding cycle to ensure accuracy of the results (e.g., broadcasting of tape-recorded vocalizations when the probability that birds are near the nest is high). For this reason, it is essential to study the behavior of species to be censused. Mysterud and Dunker (1982) and Penteriani and Pinchera (1991) concluded that passive auditory surveys of adult Eagle Owls (*Bubo bubo*) were most reliable for locating nests because the owls did not consistently respond to playback of their vocalizations, especially when they had nestlings or fledglings. Although playback and passive auditory surveys of adult Eagle Owls have been used extensively to locate territories (e.g., Bergerhausen and Willems 1988, Penteriani 1996), no one has investigated the possibility that passive auditory surveys of juveniles might also be useful for surveying Eagle Owls. Data on the vocal activity pattern and distribution of young Eagle Owls are scarce, although their call rates are very high (Kranz 1971, Mikkola 1983).

To investigate the possibility of using passive auditory surveys of juvenile Eagle Owls to locate nests and fledged young during the day, we studied diurnal patterns of vocalizations of nestling and fledgling Eagle Owls in southern France. The study was prompted by field observations that indicated that young Eagle Owls were particularly vociferous during the day (V. Penteriani and M. Gallardo unpubl. data).

METHODS

The study was conducted during 1999 on Luberon Mountain in southern France (43°53′N, 5°24′E). Elevation ranged from 160 m in the Durance River valley to 1125 m on Grand Luberon ridge. The study area was characterized by a mosaic of rock cliffs, shrub vegetation (*Quercus coccifera, Thymus vulgaris,* and *Rosmarinus officinalis*), Mediterranean forest (*Quercus ilex, Q. pubescens,* and *Pinus halepensis*), croplands, pastures, and fallow fields.

We systematically listened to young Eagle Owls from the age of about 3 wk (nestlings), when their calls are easily distinguishable, to about 8 wk (fledglings), when their calls begin to resemble those of adults (Glutz Von Blotzheim and Bauer 1980) and their diurnal vocal activity near the nest seems to decrease (V. Penteriani unpubl. data). During this period (May to July in our study area), we recorded both frequency and distribution of the main call type of young owls, the dry rasping *chwätch,* considered as a food-call (Cramp and Simmons 1980). For passive auditory surveys, we divided each day into 14 1-hr intervals, from sunrise to sunset, and evenly distributed surveys (on a rotation basis) among nine owlets (two young in a nest in four cases, one young alone in one case), randomly selected inside the study area. We distributed the surveys over the May–July period to obtain data on the vocal activity of each individual for the entire length of each solar day at the end of the eighth week of life. In each observation period, we collected the time of start of a vocal event, duration of the vocal event, and

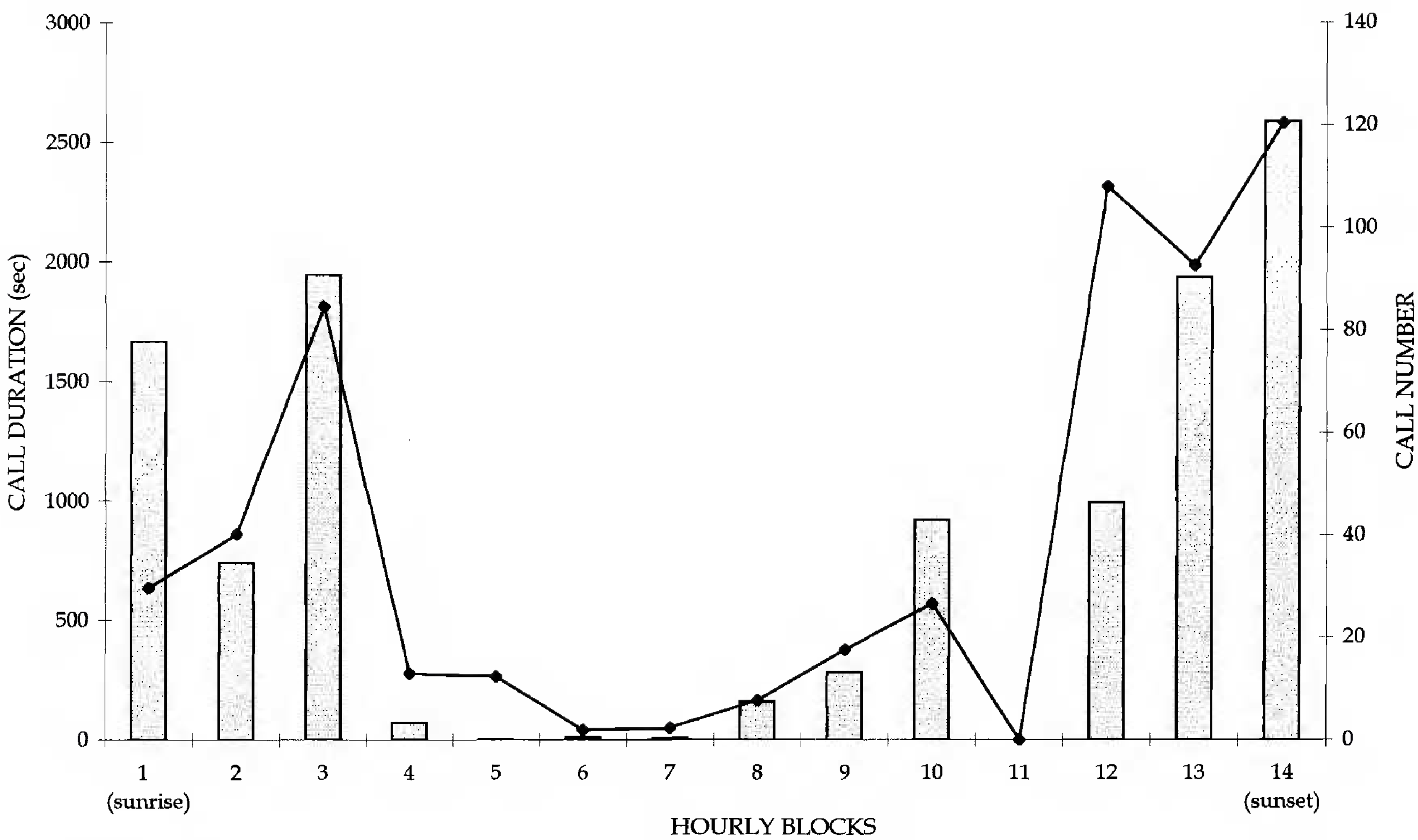

Figure 1. Diurnal vocal activity of nine young Eagle Owls in southern France: mean duration of vocalizations (sec; grey bars) and mean number of calls (solid line) by time of day. Hourly blocks represent the intervals of the day, from sunrise to sunset.

the number of vocal events. We used a stopwatch to determine the duration of a given vocal event and we identified the end of a vocal event as the last call heard more than 60 sec before the next call (i.e., 1 min of silence between calls or between sequences was regarded as a dividing unit of time). Isolated calls were arbitrarily assigned a duration of 1 sec. We did not conduct observations on windy or rainy days and always recorded vocalizations from the same location and from the same distance (<500 m from the nesting cliff). We always remained out of sight of the owls because the presence of humans alters the behavior of the young.

We used a Repeated Measures ANOVA (Sokal and Rohlf 1995) to compare the duration of vocalizations and the number of calls throughout the day. We used the Spearman rank correlation coefficient to determine a possible common pattern between the duration of the vocal events and the call number characterizing them (Sokal and Rohlf 1995).

RESULTS

The duration of vocalizations (Fig. 1; $F_{8,13} = 47.36$, $P < 0.001$) and the number of calls (Fig. 1; $F_{8,13} = 38.73$, $P < 0.001$) were significantly different in the various hourly blocks, with peaks occurring during 3 hrs after sunrise and 3 hrs before sunset (Fig. 1). A common positive pattern between the duration of the vocal events and the number of calls was observed ($r_S = 0.85$, $P < 0.001$, Spearman rank). The mean number of calls per series was 65.6 ± 127.1 (±SD, range = 1–259) (Fig. 1). Duration of vocalizations in a single series ranged from 1–1130 sec ($\bar{x} = 808.4 \pm 891.4$ sec). The maximum time interval between two neighboring series was 40 min, during the hourly block corresponding to 5 hr after sunrise. The mean interval between calls was 10.5 ± 6.02 sec (range = 2–28.7). During the passive auditory periods, all nine juveniles were heard, always in the immediate vicinity of the nest hole, even after they left the nest. In four cases where we observed adults near juveniles that were calling, the adults appeared to ignore the juveniles.

DISCUSSION

Our findings that vocalizations peaked 3 hr before sunset and 3 hr after sunrise highlighted the diurnal activity of this dominantly crepuscular and nocturnal species The typical *chwätch* call of nestling and fledgling Eagle Owls has been described as a food call (Cramp and Simmons 1980), but its high diurnal frequency, use during the period of the day coinciding with low adult activity (although young are regularly fed during the day by females, L. Dalbeck pers. comm.), and observed indifference of adults to this type of behavior make it difficult to explain how this call is used for feeding alone. It may, in fact, be a method of communicating within family groups (e.g., contact call). Fledglings of some suboscine species use their song as a contact call in their early stages of life (Kroodsma 1984) when they are just beginning to learn sounds in their environment and recognizable production of those sounds occurs a month or more later, and only after extensive practice, or subsong (Kroodsma 1981). The high rates of diurnal vocalizations in Eagle Owls may simply result from young owls practicing their voices, just as high rates of diurnal activity may represent muscular exercise (e.g., flight training).

Our results suggest that passive auditory surveys of young Eagle Owls are effective when owlets are 5–8-wk old, and are most effective during the 3-hr period after sunrise and preceding sunset. Listening sessions must be 40 min in duration. Although, in these hourly blocks, we always heard young Eagle Owl calls, we suggest two listening sessions as a precaution before considering a site as not occupied by a successfully breeding pair. Since we did not conduct surveys in the hours before sunrise and after sunset, we cannot address survey effectiveness during those periods. We recommend that listening points be selected such that they are hidden from the owls' view and at a maximum distance of 500 m from potential nesting sites, especially in noisy areas. Although the calls of young can be heard on silent nights as far as 500 m away, the background noise during diurnal hours makes listening sessions problematic. Days with wind (>15 km/hr) and intense precipitation are unsuitable for conducting surveys with this technique.

Our results suggest that passive auditory surveys during the day are useful for surveying Eagle Owls because young are normally very vocal during the day, surveys can be conducted at a time of day and year when adults are relatively secretive, and they allow estimation of the minimum number of young produced.

It would be interesting to determine if diurnal calls are typical of Eagle Owls in other European countries and of congeners. For example, it seems that there are obvious differences in diurnal call behavior between our study area and western Germany, where the calls of young are irregular during the day (W. Bergerhausen and L. Dalbeck pers. comm.). The Great Horned Owl (*Bubo virginianus*) is the geographical and ecological counterpart of the Eurasian Eagle Owl. The reasons for treating this as a distinct species have rarely been made clear (Voous 1988). It would be interesting to investigate whether the vocal behavior of young Great Horned Owls has patterns similar to those of the Eagle Owl. The Great Horned Owl seems to be relatively silent during the day, probably because diurnal begging juveniles could be subject to higher rates of predation by Northern Goshawks (*Accipiter gentilis*) and Red-tailed Hawks (*Buteo jamaicensis*), or "mobbing" by jays and crows (E. Forsman unpubl. data). However, passive surveys are useful for locating young Great Horned Owls at night or just before sunrise or after sunset, when they are quite vocal (E. Forsman unpubl. data).

RESUMEN.—Al censar aves, es esencial saber su comportamiento y ciclo reproductivo para asegurar la veracidad de los resultados. En el caso de *Bubo bubo,* un método efectivo de investigación es el de utilizar un método pasivo de audición de vocalizaciones espontaneas de adultos. Sin embargo, se conoce poco acerca de los patrones y distribución de la actividad vocal de juveniles, los cuales vociferan bastante durante el día. Observamos el comportamiento de vocalización de juveniles de búhos en el sur de Francia para determinar si pueden ser localizados consistentemente durante el día utilizando un método pasivo de audición. La duración de las vocalizaciones ($F_{8,13}$ = 47.36, $P < 0.001$) y el número de vocalizaciones ($F_{8,13}$ = 38.73, $P < 0.001$) fue significativamente diferente en distintos momentos del día, la duración de las vocalizaciones diurnas fueron mayores en las primeras 3 horas del amanecer y en las 3 horas antes del atardecer Escuchar las vocalizaciones espontáneas de juveniles puede ser considerado como un método útil para el monitoreo de búhos debido a que estos vociferan bastante durante el día. Las investigaciones deben llevarse a cabo para estimar un número mínimo de juveniles producidos. Nuestros resultados indican que la alta actividad diurna de juveniles puede estar relacionada con la necesidad de comunicarse entre el grupo familiar (i.e., vocalizaciones de contacto) para estimular la alimentación por parte de los adultos o practicar sus vocalizaciones.

[Traducción de César Márquez]

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FOOD HABITS OF THE STRIPED OWL (*ASIO CLAMATOR*) IN BUENOS AIRES PROVINCE, ARGENTINA

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KEY WORDS: *Striped Owl;* Asio clamator; *food habits; Argentina.*

The Striped Owl (*Asio clamator*) is a widespread species from Mexico through tropical and subtropical South America to Argentina (Grossman and Hamlet 1964, Canevari et al. 1991, Holt et al. 1999). It inhabits deciduous seasonal forests, lowland seasonal forests, gallery forests, lowland savannas, desert forests, and grasslands (Grossman and Hamlet 1964, Canevari et al. 1991, Holt et al. 1999). Despite its widespread distribution, the status of the Striped Owl is poorly known (Burton 1973, Holt et al. 1999) and it is considered to be a rare species in Buenos Aires Province in Argentina (Narosky and Di Giacomo 1993).

Studies of the Striped Owl in Argentina have focused mainly on anecdotal aspects of its biology and breeding ecology (e.g., Bledinger et al. 1987, Martínez et al. 1996). Its diet is poorly studied but the limited information that is available indicates that it preys mainly on small mammals (Grossman and Hamlet 1964, Burton 1973, Phelps and Meyer de Schauensee 1994) followed by birds, reptiles, and insects (Holt et al. 1999). Here, we report on the diet of Striped Owls in the southernmost extreme of its distribution in the southeastern portion of Buenos Aires Province, Argentina.

METHODS

Our study was carried out in Mar Chiquito Biosphera Reserve (37°40′S, 57°23′W), Buenos Aires Province, Argentina. The reserve covers 30 000 ha and supports a diverse array of habitats including ponds, salt marshes,

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